

# **UNIT 1: HAZARDOUS MATERIALS REVIEW**



# LEARNING OBJECTIVES

By the end of this unit, participants will be able to:

- Explain why the ability to recognize and identify hazards is important to First Responders
- Explain how the location of an incident may indicate the type and quantity of hazards present
- Distinguish between **contamination** and **exposure**
- Describe the difference between **acute** exposure and **chronic** exposure
- Describe the four major routes of entry
- Describe the toxic effects that may result from chemical exposure
- Define **medical surveillance**
- Identify the elements of medical surveillance



# INTRODUCTION

This course is designed as a refresher program to reinforce previous training in hazardous materials response. "Hazardous materials" are defined as substances that have the potential to cause harm. They include the Department of Transportation (DOT) hazardous materials (sometimes referred to as "dangerous goods"), and Environmental Protection Agency (EPA) hazardous substances and wastes.

Your rights and responsibilities as a First Responder to hazardous materials incidents are identified by the Occupational Safety and Health Administration (OSHA) in Regulation 29 CFR 1910.120 or EPA 40 CFR 311.

## Course Reference Materials

Throughout this course you will be asked to look up various chemicals in two reference books, the *North American Emergency Response Guidebook* and the *NIOSH Pocket Guide to Chemical Hazards*. Your instructor will distribute copies of these resources for your use during class and show you how to use them. As a First Responder, you should obtain your own copies of these books as a permanent reference.



# TYPES OF ALARMS

Hazardous materials can be found in virtually any type of setting. You may find them at non-structural emergencies, such as gas leaks, fires at open waste disposal sites, brush fires, and other “suspicious odor” calls that occur outside.

## Structural Fires

Structural fires often involve hazardous materials. For example, medical facilities contain dangerous substances such as liquid oxygen, formaldehyde, mercury and ether. Other industries use and process millions of tons of hazardous materials every year and the amount is growing five to ten percent annually. Even residences are not exempt from hazardous materials. Pool chemicals, compressed propane for a gas barbecue grill, pesticides, paints and solvents all can be extremely dangerous if they are present in sufficient quantities.

### ***Howell, New York, August, 1994***

*After reports of unusual activity, police discovered a bomb factory in this residential subdivision. The bomb maker was a 15-year old high school freshman. For over a year he had been making C4 explosives – the type used by terrorists. Hazardous materials specialists were able to remove all the chemicals without evacuating the neighborhood, but about 20 specially-equipped vehicles were needed to haul them away. Authorities speculated that had the house exploded, it would have taken part of the subdivision with it. — “Hazardous Materials Emergencies,” John R. Cashman, 1995*

TABLE 1.1 HAZARDS CHECKLIST STRUCTURAL ALARMS	
IF THESE SITES ARE INVOLVED...	LOOK FOR THESE HAZARDS:
Hospitals, medical labs or clinics	Biological waste Infectious patients or lab animals Radioactive materials Compressed and anesthetic gases Cryogenic liquid oxygen Syringes, sharp instruments Ethylene oxide Nitrous oxides Radioisotopes
Manufacturing and processing	Resins (alkyds, vinyls) Pigments (dry metallic powders) Compressed gases Ammonia refrigerant Lubricating and cooking oils Dusts and nitrocellulose (cotton fibers) Aerosols Radioisotopes and radioactive materials
Retail and commercial	Flammable gases and liquids Corrosives
Business offices	Cleaning products Copy chemicals (anhydrous ammonia)
Residences and hotels	Gasoline and solvents Pesticides and fertilizers Pool products Paint Cleaning supplies Illegal drug labs
Schools	Pool products Cleaning products Lab chemicals such as: Acids and bases Peroxides and ethers Alcohols and solvents
Farms	Pesticides Oxidizers Anhydrous ammonia
Construction	Ammonium nitrate fuel oil mixture (ANFO) Compressed gases Solvents Radioisotopes
Mining	Methane Coal dust and metal sulfide ores Radioactive materials (uranium)
Semiconductor manufacturing	Organic liquids (butyl acetone, toluene) Cyanide, carbon monoxide Arsine gas Phosphine

# Transportation Alarms

Identifying hazardous materials is more difficult at transportation incidents than at fixed sites, simply because there is less control over the situation. You may have little information about the amount and type of cargo, particularly with highway shipments. Because of this, the Department of Transportation (DOT) regulates the shipment of dangerous substances by public highway, rail, aircraft, and waterway. All DOT regulations are detailed in the Code of Federal Regulations (CFR) Title 49. The table below shows a breakdown of hazardous materials involved in accidents during the 1980s.

Incident Reports Involving Hazardous Materials	
Flammable Liquids	39.9%
Corrosive Materials	37.9%
Combustible Liquids	6.4%
Poisons (B)	4.3%
Compressed Gas (flammable)	1.9%
Oxidizing Materials	2.7%
Compressed Gas (non-flammable)	2.1%
Radioactive Materials	0.3%
Other	4.5%

TABLE 1.2 HAZARDS CHECKLIST NON-STRUCTURAL AND TRANSPORTATION ALARMS	
IF THESE SITES ARE INVOLVED...	LOOK FOR THESE HAZARDS:
Construction materials	Explosion hazards Gas leaks Pressurized containers Temporary electrical equipment
Trenches, tanks, or other confined spaces	Asphyxiants Oxygen-deficient atmospheres Other toxic gases
LP tanks	Containers under pressure Butane, propane Other flammable gases
Unidentified odors	Gas leaks Toxic chemicals
Victims down; no apparent reasons	Asphyxiants Toxic gases Biological hazards
Trash, garbage, or other wastes, as well as unknown materials	Solvents Aerosols Flammable liquids Medical waste Poisons Radioactive materials Biological hazards All other dangerous materials
Electrical transformers	Mineral oil Polychlorinated biphenyls (PCBs)
Cargo Tanks	Corrosives Gasoline and fuels Methanol Ethyl alcohol Crude oil Asphalts Propane, butane, and LP gases Anhydrous ammonia Liquid oxygen Bulk flowable commodities Containers under pressure Multiple products Radioactive materials
Rail cars	Chlorine Propane, butane Anhydrous ammonia Poisons Corrosives Flammable liquids Containers under pressure Multiple products Radioactive materials
Adjacent chemical, manufacturing, or utilities	All types of hazardous materials

# HEALTH AND SAFETY

The term “hazardous materials” covers a broad range of substances with a wide variety of effects. Some materials are highly toxic to humans. Others are dangerous primarily because they are flammable, though many can cause health effects as well. Exposure to various hazardous materials may have immediate effects, delayed effects, or no detectable effects at all. Although no standard operating procedures can protect you against all hazards, your department should establish and follow operating procedures that minimize your exposure to hazardous materials. To help protect yourself, you must become familiar with the health effects of various chemicals so that you can recognize early signs and symptoms of exposure, provide effective first aid to victims, and give complete information to your health care provider about exposures.

This section discusses how hazardous materials exposures can occur, the different ways that toxic substances can affect the body, and where you can turn for additional information.

## Exposures and Effects

You can often prevent exposure to hazardous materials even if you must work in close proximity to a hazardous substance. For example, your positive-pressure self-contained breathing apparatus prevents your exposure to carbon monoxide during fire fighting. In some cases, however, your equipment cannot adequately protect you from the hazards at the scene; many gases and vapors can easily penetrate turnout clothing. To prevent exposure, you need to become familiar with the limitations of your turnout clothing.

### Contamination vs. Exposure

It is sometimes difficult to distinguish between exposure and contamination. You might think of yourself as “exposed” whenever you are in the vicinity of a hazard. However, for the purposes of this program, we will assume that you are **exposed** when you contact a harmful substance and your body reacts in some way. The material may or may not remain on or in your body. We will assume that you are **contaminated** when you contact a harmful substance and the material remains on or in your body. Your body may or may not react to the substance.

## Acute vs. Chronic Effects

Acute and chronic “effects” are often confused with acute and chronic “exposures.” These are best defined in 29 CFR 1910.1200, Appendix A. This regulation states that:

*Generally, the terms “acute” and “chronic” are used to delineate between effects on the basis of severity or duration. Acute effects usually occur rapidly as a result of short-term exposures, and are of short duration. Chronic effects generally occur as a result of long-term exposure, and are of long duration.*

For many agents, the effects following different types of exposures are very different.

For example, the primary toxic acute effect of a short-term exposure to benzene is central nervous system depression causing confusion, a “high” feeling, and possibly some difficulty breathing. On the other hand, a chronic effect of long-term exposure to benzene is cancer.

## Routes of Entry

There are four routes through which hazardous materials can enter your body:

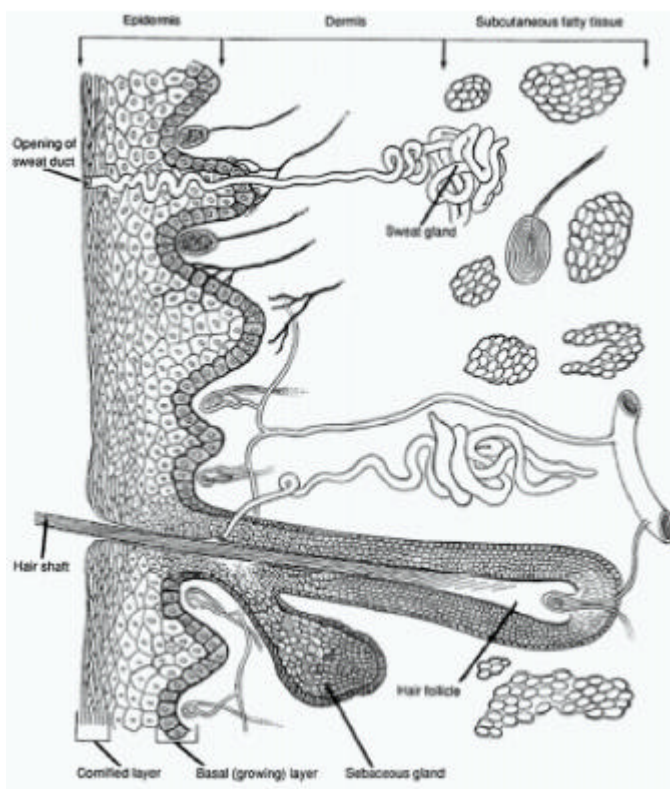
- Direct contact via skin and mucous membranes
- Inhalation
- Ingestion
- Penetration

Direct contact and inhalation, which are discussed below, are the two most common routes of exposure for fire fighters.

### Direct Contact

Intact skin provides a barrier that varies in its protective effectiveness depending on its condition, the site of contact, and the properties of the hazardous material. Your body will absorb more if:

- The entry site has an abundance of hair follicles, such as the scalp, forehead, jaw area, and underarm (for example, the potential for exposure is twelve times greater in the groin area than the forearm)
- You are in contact with the substance over a longer period of time
- The chemical is concentrated
- Skin temperature is relatively high and blood supply heavy at the entry site. Usually, the more chemical absorbed, the more severe the health effects.



Certain categories of substances, such as fat-soluble chemicals, are more easily absorbed by the skin. For example, paint thinner and other solvents can be absorbed through the skin during direct contact.

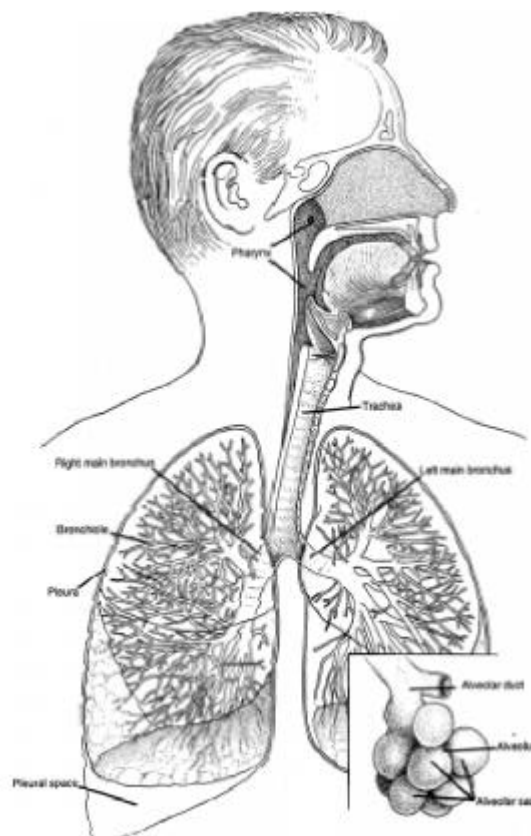
Hair follicles and pores are the entry points for chemicals. These openings on the epidermis allow chemicals to penetrate deep into the dermis and subcutaneous tissue.

Intact skin is normally a good barrier to foreign substances. However, skin can be damaged by mechanical injury (trauma), thermal injury (heat or cold), or chemical exposure. Damaged skin is more susceptible to further damage from hazardous materials and may allow more chemicals to be absorbed. Absorption may also be enhanced if the substance and skin are covered, for example, by a bandage or clothing that traps a chemical. Moisture on the skin, especially sweat, also increases absorption.

Skin may be directly affected by exposure, as in the case of corrosives. Or, it may provide a route of entry for hazardous materials, and not be affected by the absorbed material.

## Inhalation

The lungs act as a **transfer point** in the human body. Oxygen and other substances pass from the atmosphere to the bloodstream, and carbon dioxide passes from the bloodstream to the atmosphere. Many chemicals are absorbed through the respiratory system after they have been inhaled. The respiratory system does have some protective features. Cilia (hair-like projections) line the main airway and trap foreign particles, pushing them toward the throat where they can be swallowed. However, most small particles and gases can penetrate deep into the lungs and bronchial tree. Bronchioles at the end of the bronchial tree can pass chemicals into the bloodstream.

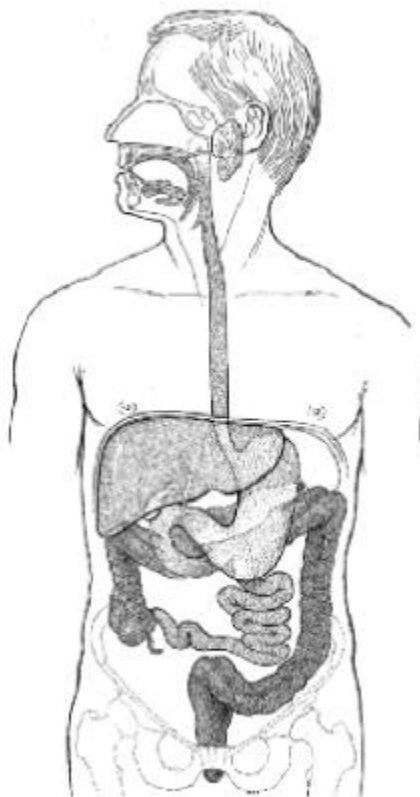


Like the skin, the lungs may serve as a route of entry and may not be affected by the inhaled hazardous material. For example, carbon monoxide easily enters the bloodstream when inhaled. There it binds with red blood cells and prevents oxygen from entering the body's tissues. Solvent vapors are also absorbed after inhalation, and may affect only the nervous system. With any inhalation exposure, absorption is increased when the rate and depth of respiration is increased.

## Ingestion

The gastrointestinal system includes the mouth, pharynx, esophagus, stomach, small intestine, and large intestine. Collectively, these organs are responsible for the absorption, digestion, and storage of nutrients.

Like all routes of exposure, the gastrointestinal system can be directly affected by hazardous materials, or may serve as the point of entry for a chemical that affects other organs in the body.



Although hazardous materials exposure through ingestion is common in cases of suicide and childhood poisoning, it is less common in work and environmental exposures.

However, ingestion can occur when hazardous substances come in direct contact with the mouth or when contaminated hands or clothing come into contact with the mouth. It is also possible to consume toxic materials by eating or smoking in an environment where food and cigarettes are contaminated.

## Penetration

Penetration can also be considered a route of entry for toxic chemicals. Penetration can be **intra**dermal (into the skin), **sub**cutaneous (under the skin), **intra**venous (into a vein), or **intra**muscular (into a muscle). First Responders are not as commonly exposed via penetration as by the other three routes.

Generally, penetrations are the result of contact with a physical agent, such as:

- Syringes
- High pressure devices (e.g., pressurized steam lines or pneumatic lines)
- Sharp objects such as jagged pieces of glass or metal

# Types of Toxic Effects

Different chemicals have different effects on the body. Some effects are acute; others are chronic depending on the length of exposure. A single chemical may produce a range of effects. The effects of chemicals are not always well-researched, so you should document all significant exposures and be alert for any changes in normal body functions.

References often provide information about toxic substances based on their toxic effects. There are several categories of toxic chemicals.

## Asphyxiants

Asphyxiants are gases that deprive the body tissue of oxygen. There are two types of asphyxiants: **simple asphyxiants** and **chemical asphyxiants**.

Simple asphyxiants displace oxygen. Examples include methane and nitrogen. If the oxygen concentration in the atmosphere drops too low, it cannot support life.

The normal concentration of oxygen in air is 20.9 percent. Atmospheres with lower concentrations are considered oxygen-deficient, especially if the concentration of oxygen is less than 19.5 percent. Oxygen deficiencies typically occur in confined spaces such as tanks, underground spaces, or enclosed rooms. Even if oxygen levels are between the acceptable range of 19.5 to 23.5 percent there can still be a toxic atmosphere.

Chemical asphyxiants are gases that prevent oxygen use by the body's tissues, even though enough oxygen is inhaled. Carbon monoxide is probably the chemical asphyxiant with which most fire fighters are familiar.

## Corrosives

Corrosives can cause irreversible tissue damage. Caustic soda and sulfuric acid are common examples. Mild tissue damage from a corrosive may resemble a burn from heat. Acids and alkalis (bases) are corrosives. Their effects depend on the concentration of the chemical and the strength of the acid or base. Hydrochloric acid, for instance, is a stronger acid than acetic acid, which is found in vinegar. Many radioactive materials are also corrosive. For example, the corrosive properties of uranium hexafluoride are much more dangerous than the radioactive properties.

## **Irritants**

Irritants can cause effects ranging from uncomfortable to fatal. Some irritants can cause chronic damage to other organs and systems. For example, sulfur dioxide (SO<sub>2</sub>) is a colorless gas with a sharp irritating odor commonly used for disinfecting, bleaching, and preservation. The primary organs affected by exposure to sulfur dioxide are the skin, eyes and respiratory system. Continued or very heavy exposures can affect the central nervous system, the cardiovascular, gastrointestinal, and renal systems, and metabolism. Extremely high or long-term doses can lead to pulmonary edema and anaphylaxis.

## **Sensitizers**

Sensitizers can cause allergic reactions after repeated exposures. Gasoline and many pesticides are examples. A reaction may appear several hours after exposure to the sensitizing chemical. Reactions vary, depending on the route of exposure. Also, reactions may be different because some people are more susceptible to the effects of sensitizers. Repeated exposure may cause a rash on skin, or an asthma-like reaction if the sensitizer is inhaled.

## **Carcinogens**

Substances that cause cancer are called carcinogens. Benzene and some polyaromatic hydrocarbons are suspected carcinogens. Some carcinogens are known to cause cancer in humans; others are known to cause cancer in laboratory animals and are suspected of causing cancer in humans. It is difficult to study the cancer-causing potential of chemicals among humans for several reasons. Cancers may take up to 20 years to develop following exposure. Asbestos is one example. Levels of exposure to a particular chemical may be difficult to document. Also, very little is known about the effects of exposure to multiple carcinogens.

## **Neurotoxins**

Neurotoxic chemicals cause damage—either permanent or reversible—to the central nervous system (the brain and the spinal cord) or the peripheral nervous system (the nerves responsible for movement and sensation in the arms, hands, legs, and feet). Neurotoxins can affect the central or peripheral nervous systems by blocking the electrical signals that the brain sends and receives, or by exciting the systems to send false signals. Symptoms range from uncomfortable to life-threatening, depending on the chemical and the dose. Solvents such as gasoline and benzene are examples of neurotoxins.

## Biological Hazards

Like chemicals, biological agents can enter your body through inhalation, ingestion, skin contact, or injection. Biological agents can also enter the bloodstream directly through breaks in the skin.

Infectious agents include **viruses**, such as hepatitis A, hepatitis B, hepatitis C, human immunodeficiency virus (HIV), and the herpes virus.

**Bacteria** are also infectious organisms that can cause disease in humans. In general, bacteria are better adapted than viruses to live outside of the body. Different types of bacteria cause tuberculosis, strep throat, and most wound infections. Tuberculosis infections are currently increasing and are of concern to responders who have direct patient contact.

Any container that carries a biohazard symbol (as shown below) carries an infectious material. Also, keep in mind that laboratory specimens, particularly “red bag” waste from hospitals or laboratories may be infectious. By pre-planning your area, especially laboratories and health care facilities, you can become familiar with the infectious agents you are likely to encounter in an emergency.





# GENERAL PRECAUTIONS

The best way to protect yourself against health risks is, of course, to avoid exposure in the first place.

You can avoid exposure by:

- Being alert to the possible presence of hazardous materials and remaining at a safe distance
- Protecting the four routes of entry by wearing the proper protective equipment and positive-pressure self-contained breathing apparatus
- Avoiding secondary contamination by making sure that contaminated patients and equipment are decontaminated before you have contact with them
- Avoiding ongoing exposure by making sure that you and your clothing are fully decontaminated as soon as possible

In addition, you can prevent health effects from infectious organisms by obtaining all vaccinations that are necessary for your area and your likely exposures. And, finally, you can also increase your resistance to disease and infections by maintaining good health habits.



# MEDICAL SURVEILLANCE

Medical surveillance is the collection and interpretation of data from monitoring programs and other available sources for the purpose of detecting changes in health status. The focus of medical surveillance is on identifying changes that have already taken place and providing a means of addressing potential medical problems. Ideally, surveillance should be performed on First Responders throughout their working lifetimes.

A medical surveillance program must be reviewed periodically. Information on specific exposures, working conditions, and use of protective equipment must be incorporated into the review.

## Elements of Medical Surveillance

The health status information required for a medical surveillance program is gathered from several different sources:

- Baseline physical examinations
- Annual/biannual examinations
- Exposure-specific or injury examinations
- Exit examinations
- Personal exposure records

### Baseline Physical Examinations

Your baseline, or entry examination should be a comprehensive study of all body systems, especially vision, hearing, cardiovascular, pulmonary, liver function, blood testing, and musculoskeletal systems. The purpose of this exam is to establish a baseline against which later tests can be measured. Differences between baseline results and subsequent testing may indicate a change in your health status. Baseline exams should also include questionnaire data about your medical history, occupation, family, and background. Be sure to discuss with your doctor any current symptoms that might be related to exposure to hazardous substances.

### Annual Examinations

Like your baseline exam, an annual or biannual exam should include a comprehensive study of all body systems. The results of these studies should be compared to your baseline exam. Your doctor should then assess your health status, note any changes, and discuss them with you. During these exams be sure to tell your doctor of any possible exposures, changes in your medical history or background, symptoms of illness, or other conditions that might affect your overall health picture.

## **Exposure-Specific Examinations**

You should have an exposure-specific examination whenever you think you may have been exposed to a hazardous substance. These exams usually include biological monitoring to measure the amount of a substance in your body fluid, or its effects.

Ordinarily, biological monitoring is not included in a general medical surveillance program because of the lack of knowledge about the chemicals involved and the lack of specific tests to evaluate exposure. However, if you are exposed to an agent for which specific tests are available, you should have those tests conducted.

## **Exit Examinations**

When you leave your job or are transferred to another type of work, you should have an exit exam. This physical exam should include the same tests that your physician conducted during your baseline exam. Any changes from your baseline should be discussed with you.

You should also let your physician know of any changes in your health status that have occurred since your last annual exam.

## **Personal Exposure Records**

Although your work record will contain most of your medical history, you should keep your own records as well. Note the results of tests, dates and conditions of possible or known exposures, and any treatments you received. These records are important because you may not always realize you were exposed, particularly if you have no symptoms. In addition, some symptoms may appear long after exposure. Having these records on hand will help refresh your memory about an incident if you need later treatment for an exposure.

# Medical Surveillance for First Responders

The federal regulations pertaining to hazardous materials emergency response operations are found in Title 29 of the Code of Federal Regulations, Part 1910.120 (29 CFR 1910.120). This law is duplicated by the EPA in 40 CFR 311 for First Responders not covered by OSHA in their state.

In addition, the National Fire Protection Association developed a standard for fire department occupational safety and health programs (NFPA 1500). This standard addresses the need for a comprehensive approach to the health and safety of fire fighters and emergency medical care providers. For your own protection, you should be familiar with these laws and guidelines.

The OSHA regulation has specific requirements regarding medical surveillance. These are minimum requirements; state and local laws may exceed these requirements. Under 29 CFR 1910.120, fire fighters who operate as members of hazardous materials teams must be provided with a medical surveillance program. Information from questionnaires, medical exams, and diagnostic medical testing must be collected every one to two years for hazardous materials team members.

First Responders who are not members of hazardous materials teams are required to participate in medical surveillance programs if they are exposed to hazardous substances for thirty or more days per year at or above exposure limits set by OSHA. Medical surveillance is also required if you are injured at an emergency incident involving hazardous substances.

Records from medical surveillance must be kept confidential for 30 years. Records on radiological exposures must be kept for 50 years. You must be informed of the results of any examinations and tests. Your physician will provide a written report. However, your employer should be informed only of any work restrictions, not of the specific condition that results in the restriction.

If you are exposed to a hazardous material, a health professional trained in toxicology or occupational medicine can help you determine possible effects and any appropriate treatment if you know:

- The identity of the material involved
- The concentration of the material when the exposure occurred
- The duration of exposure



# **UNIT 1**

## **APPENDIX**



## 29 CFR 1910.120

### Hazardous Waste Operations and Emergency Response

#### **(a) Scope, application, and definitions.**

(1) Scope. This section covers the following operations, unless the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards: (i) Clean-up operations required by a governmental body, whether Federal, state local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained; (ii) Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq); (iii) Voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites; (iv) Operations involving hazardous waste that are conducted at treatment, storage, disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations; and (v) Emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

(2) Application. (i) All requirements of Part 1910 and Part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste and emergency response operations whether covered by this section or not. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 29 CFR 1910.5(c)(1). (ii) Hazardous substance clean-up operations within the scope of paragraphs (a)(1)(i) through (a)(1)(iii) of this section must comply with all paragraphs of this section except paragraphs (p) and (q). (iii) Operations within the scope of paragraph (a)(1)(i) of this section must comply only with the requirements of paragraph (p) of this section.

Notes and Exceptions: (A) All provisions of paragraph (p) of this section cover any treatment, storage or disposal (TSD) operation regulated by 40 CFR parts 264 and 265 or by state law authorized under RCRA, and required to have a permit or interim status from EPA pursuant to 40 CFR 270.1 or from a state agency pursuant to RCRA. (B) Employers who are not required to have a permit or interim status because they are conditionally exempt small quantity generators under 40 CFR 261.5 or are generators who qualify under 40 CFR 262.34 for exemptions from regulation under 40 CFR 262.34 for exemptions from regulation under 40 CFR parts 264, 265, and 270 ("excepted employers") are not covered by paragraphs (p)(1) through (p)(7) of this section. Excepted employers who are required by the EPA or state agency to have their employees engage in emergency response or who direct their employees to engage in emergency response are covered by paragraph (p)(8) of this section, and cannot be exempted by (p)(8)(i) of this section. (C) If an area is used primarily for treatment, storage or disposal, any emergency response operations in that area shall comply with paragraph (p) (8) of this section. In other areas not used primarily for treatment, storage, or disposal, any emergency response operations shall comply with paragraph (q) of this section. Compliance with the requirements of paragraph (q) of this section shall be deemed to be in compliance with the requirements of paragraph (p)(8) of this section.

(iv) Emergency response operations for releases of, or substantial threats of releases of, hazardous substances which are not covered by paragraphs (a)(1)(i) through (a)(1)(iv) of this section must only comply with the requirements of paragraph (q) of this section.

(3) Definitions - "Buddy system" means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency. "Clean-up operation" means an operation where hazardous substances are removed, contained, incinerated, neutralized, destabilized, cleared-up, or in any other

manner processed or handled with the ultimate goal of making the site safer for people or the environment. "Decontamination" means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects. "Emergency response" or "responding to emergencies" means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses. "Facility" means (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel. "Hazardous materials response (HAZMAT) team" means an organized group of employees, designated by the employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department. "Hazardous substance" means any substance designated or listed under (A) through (D) of this definition, exposure to which results or may result in adverse effects on the health or safety of employees: [A] Any substance defined under section 101(14) of CERCLA; [B] Any biologic agent and other disease causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring. [C] Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 ; and [D] Hazardous waste as herein defined. "Hazardous waste" means - A) A waste or combination of wastes as defined in 40 CFR 261.3, or [B] Those substances defined as hazardous wastes in 49 CFR 171.8. "Hazardous waste operation" means any operation conducted within the scope of this standard. "Hazardous waste site" or "Site" means any facility or location within the scope of this standard at which hazardous waste operations take place. "Health hazard" means a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in Appendix A to 29 CFR 1910.1200. "IDLH" or "Immediately dangerous to life or health" means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere. "Oxygen deficiency" means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen. "Permissible exposure limit" means the exposure, inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subparts G and Z. "Published exposure level" means the exposure limits published in "NIOSH Recommendations for Occupational Health Standards" dated 1986, which is incorporated by reference as specified in Sec. 1910.6, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1987 - 88" dated 1987, which is incorporated by reference as specified in Sec. 1910.6. "Post emergency response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who

were part of the initial emergency response, it is considered to be part of the initial response and not post emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be considered to be performing post-emergency response and subject to paragraph (q)(11) of this section. "Qualified person" means a person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control. "Site safety and health supervisor (or official)" means the individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements. "Small quantity generator" means a generator of hazardous wastes who in any calendar month generates no more than 1,000 kilograms (2,205) pounds of hazardous waste in that month. "Uncontrolled hazardous waste site" means an area identified as an uncontrolled hazardous waste site by a governmental body, whether Federal, state, local or other where an accumulation of hazardous substances creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands such as those created by former municipal, county or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous substance wastes. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at TSD sites are not covered by this definition.

**(b) Safety and health program.**

NOTE TO (b): Safety and health programs developed and implemented to meet other federal, state, or local regulations are considered acceptable in meeting this requirement if they cover or are modified to cover the topics required in this paragraph. An additional or separate safety and health program is not required by this paragraph.

(1) General. (i) Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations. (ii) The written safety and health program shall incorporate the following: (A) An organizational structure; (B) A comprehensive workplan; (C) A site-specific safety and health plan which need not repeat the employer's standard operating procedures required in paragraph (b)(1)(ii)(F) of this section; (D) The safety and health training program; (E) The medical surveillance program; (F) The employer's standard operating procedures for safety and health; and (G) Any necessary interface between general program and site specific activities. (iii) Site excavation. Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926. (iv) Contractors and sub-contractors. An employer who retains contractor or sub-contractor services for work in hazardous waste operations shall inform those contractors, sub-contractors, or their representatives of the site emergency response procedures and any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by the employer's information program. (v) Program availability. The written safety and health program shall be made available to any contractor or subcontractor or their representative who will be involved with the hazardous waste operation; to employees; to employee designated representatives; to OSHA personnel, and to personnel of other Federal, state, or local agencies with regulatory authority over the site.

(2) Organizational structure part of the site program. (i) The organizational structure part of the program shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include, at a minimum, the following elements: (A) A general supervisor who has the responsibility and authority to direct all hazardous waste operations. (B) A site safety and health supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance. (C) All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities. (D) The lines of authority, responsibility, and communication. (ii) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

(3) Comprehensive workplan part of the site program. The comprehensive workplan part of the program shall address the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives. (i) The comprehensive workplan shall define anticipated clean-up activities as well as normal operating procedures which need not repeat the employer's procedures available elsewhere. (ii) The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives. (iii) The comprehensive workplan shall establish personnel requirements for implementing the plan. (iv) The comprehensive workplan shall provide for the implementation of the training required in paragraph (e) of this section. (v) The comprehensive workplan shall provide for the implementation of the required informational programs required in paragraph (i) of this section. (vi) The comprehensive workplan shall provide for the implementation of the medical surveillance program described in paragraph (f) if this section.

(4) Site-specific safety and health plan part of the program. (i) General. The site safety and health plan, which must be kept on site, shall address the safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection. (ii) Elements. The site safety and health plan, as a minimum, shall address the following: (A) A safety and health risk or hazard analysis for each site task and operation found in the workplan. (B) Employee training assignments to assure compliance with paragraph (e) of this section. (C) Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in paragraph (g)(5) of this section. (D) Medical surveillance requirements in accordance with the program in paragraph (f) of this section. (E) Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used. (F) Site control measures in accordance with the site control program required in paragraph (d) of this section. (G) Decontamination procedures in accordance with paragraph (k) of this section. (H) An emergency response plan meeting the requirements of paragraph (i) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment. (I) Confined space entry procedures. (J) A spill containment program meeting the requirements of paragraph (j) of this section. (iii) Pre-entry briefing. The site specific safety and health plan shall provide for pre-entry briefings to be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. The information and data obtained from site characterization and analysis work required in paragraph (C) of this section shall be used to prepare and update the site safety and health plan. (iv) Effectiveness of site safety and health plan. Inspections shall be conducted by the site safety and health supervisor or, in the absence of that individual, another individual who is knowledgeable in occupational safety and health, acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by the employer.

### **(c) Site characterization and analysis.**

(1) General. Hazardous waste sites shall be evaluated in accordance with this paragraph to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

(2) Preliminary evaluation. A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

(3) Hazard identification. All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

(4) Required information. The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site: (i) Location and approximate size of the site. (ii) Description of the response activity and/or the job task to be performed. (iii) Duration of the planned employee activity. (iv) Site topography and accessibility by air and roads. (v) Safety and health hazards expected at the site. (vi) Pathways for hazardous substance dispersion. (vii) Present status and capabilities of emergency response teams that would provide assistance to on-site employees at the time of an emergency. (viii) Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.

(5) Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements: (i) Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below permissible exposure limits and published exposure levels for known or suspected hazardous substances and health hazards and which will provide protection against other known and suspected hazards identified during the preliminary site evaluation. If there is no permissible exposure limit or published exposure level, the employer may use other published studies and information as a guide to appropriate personal protective equipment. (ii) If positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble, and if respiratory protection is warranted by the potential hazards identified during the preliminary site evaluation, an escape self-contained breathing apparatus of at least five minute's duration shall be carried by employees during initial site entry. (iii) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site an ensemble providing equivalent to Level B PPE shall be provided as minimum protection, and direct reading instruments shall be used as appropriate for identifying IDLH conditions. (See Appendix B for guidelines on Level B protective equipment.) (iv) Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with paragraph (g) of this section.

(6) Monitoring. The following monitoring shall be conducted during initial site entry when the site evaluation produces information which shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient reasonably to eliminate these possible conditions: (i) Monitoring with direct reading instruments for hazardous levels of ionizing radiation. (ii) Monitoring the air with appropriate direct reading test equipment for (i.e., combustible gas meters, detector tubes) for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances.) (iii) Visually observing for signs of actual or potential IDLH or other dangerous conditions. (iv) An ongoing air monitoring program in accordance with paragraph (h) of this section shall be implemented after site characterization has determined the site is safe for the start-up of operations.

(7) Risk identification. Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication Standard, 29 CFR 1910.1200, training required by that standard need not be duplicated. NOTE TO (c)(7). - Risks to consider include, but are not limited to: [a] Exposures exceeding the permissible exposure limits and published exposure levels. [b] IDLH Concentrations. [c] Potential Skin Absorption and Irritation Sources. [d] Potential Eye Irritation Sources. [e] Explosion Sensitivity and Flammability Ranges. [f] Oxygen deficiency.

(8) Employee notification. Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities. The employer may utilize information developed for the hazard communication standard for this purpose.

#### **(d) Site control.**

(1) General. Appropriate site control procedures shall be implemented to control employee exposure to hazardous substances before clean-up work begins.

(2) Site control program. A site control program for protecting employees which is part of the employer's site safety and health program required in paragraph (b) of this section shall be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available.

(3) Elements of the site control program. The site control program shall, as a minimum, include: A site map; site work zones; the use of a "buddy system"; site communications including alerting means for emergencies; the standard operating procedures or safe work practices; and, identification of the nearest medical assistance. Where these requirements are covered elsewhere they need not be repeated.

#### **(e) Training.**

(1) General. (i) All employees working on site (such as but not limited to equipment operators, general laborers and others) exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site shall receive training meeting the requirements of this paragraph before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review training as specified in this paragraph. (ii) Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

(2) Elements to be covered. The training shall thoroughly cover the following: (i) Names of personnel and alternates responsible for site safety and health; (ii) Safety, health and other hazards present on the site; (iii) Use of PPE; (iv) Work practices by which the employee can minimize risks from hazards; (v) Safe use of engineering controls and equipment on the site; (vi) Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and (vii) The contents of paragraphs (G) through (J) of the site safety and health plan set forth in paragraph (b)(4)(ii) of this section.

(3) Initial training. (i) General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor. (ii) Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct

supervision of a trained, experienced supervisor. (iii) Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor. (iv) Workers with 24 hours of training who are covered by para-graphs (e)(3)(ii) and (e)(3)(iii) of this section, and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and two days of training necessary to total the training specified in paragraph (e)(3)(i).

(4) Management and supervisor training. On-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations shall receive 40 hours initial and three days of supervised field experience (the training may be reduced to 24 hours and one day if the only area of their responsibility is employees covered by paragraphs (e)(3)(ii) and (e)(3)(iii) and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

(5) Qualifications for trainers. Trainers shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter.

(6) Training certification. Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1) through (e)(4) of this section shall be certified by their instructor or the head instructor and trained supervisor as having completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements of paragraph (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

(7) Emergency response. Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to such expected emergencies.

(8) Refresher training. Employees specified in paragraph (e)(1) of this section, and managers and supervisors specified in paragraph (e)(4) of this section, shall receive eight hours of refresher training annually on the items specified in paragraph (e)(2) and/or (e)(4) of this section, any critique of incidents that have occurred in the past year that can serve as training examples of related work, and other relevant topics.

(9) Equivalent training. Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraphs (e)(1) through (e)(4) of this section shall not be required to provide the initial training requirements of those paragraphs to such employees and shall provide a copy of the certification or documentation to the employee upon request. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site experience.

#### **(f) Medical surveillance.**

(1) General. Employees engaged in operations specified in paragraphs (a)(1)(i) through (a)(1)(iv) of this section and not covered by (a)(2)(iii) exceptions and employers of employees specified in paragraph (q)(9) shall institute a medical surveillance program in accordance with this paragraph.

(2) Employees covered. The medical surveillance program shall be instituted by the employer for the following employees: (I) All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year; (ii) All employees who wear a respirator for 30 days or more a year or as required by 1910.134; (iii) All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and (iv) Members of HAZMAT teams.

(3) Frequency of medical examinations and consultations. Medical examinations and consultations shall be made available by the employer to each employee covered under paragraph (f)(2) of this section on the following schedules: (I) For employees covered under paragraphs (f)(2)(I), (f)(2)(ii), and (f)(2)(iv); (A) Prior to assignment; (B) At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate; (C) At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months. (D) As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation; (E) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary. (ii) For employees covered under paragraph (f)(2)(iii) and for all employees including of employers covered by paragraph (a)(1)(iv) who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used: (A) As soon as possible following the emergency incident or development of signs or symptoms; (B) At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

(4) Content of medical examinations and consultations. (I) Medical examinations required by paragraph (f)(3) of this section shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site. (ii) The content of medical examinations or consultations made available to employees pursuant to paragraph (f) shall be determined by the attending physician. The guidelines in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (See Appendix D, reference # 10) should be consulted.

(5) Examination by a physician and costs. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(6) Information provided to the physician. The employer shall provide one copy of this standard and its appendices to the attending physician and in addition the following for each employee: (I) A description of the employee's duties as they relate to the employee's exposures, (ii) The employee's exposure levels or anticipated exposure levels. (iii) A description of any personal protective equipment used or to be used. (iv) Information from previous medical examinations of the employee which is not readily available to the examining physician. (v) Information required by 1910.134.

(7) Physician's written opinion. (I) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following: (A) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use. (B) The physician's recommended limitations upon the employees assigned work. (C) The results of the medical examination and tests if requested by the

employee. (D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment. (ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.

(8) Recordkeeping. (I) An accurate record of the medical surveillance required by paragraph (f) of this section shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR 1910.20. (ii) The record required in paragraph (f)(8)(I) of this section shall include at least the following information: (A) The name and social security number of the employee; (B) Physicians' written opinions, recommended limitations and results of examinations and tests; (C) Any employee medical complaints related to exposure to hazardous substances; (D) A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

### **(g) Engineering controls, work practices, and personal protective equipment for employee protection.**

Engineering controls, work practices and PPE for substances regulated in Subpart Z.

(I) Engineering controls, work practices, personal protective equipment, or a combination of these shall be implemented in accordance with this paragraph to protect employees from exposure to hazardous substances and safety and health hazards. (1) Engineering controls, work practices and PPE for substances regulated in Subparts G and Z. (I) Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by 29 CFR Part 1910, to the extent required by Subpart Z, except to the extent that such controls and practices are not feasible. NOTE TO (g)(1)(I): Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards. (ii) Whenever engineering controls and work practices are not feasible, or not required, any reasonable combination of engineering controls, work practices and PPE shall be used to reduce and maintain to or below the permissible exposure limits or dose limits for substances regulated by 29 CFR Part 1910, Subpart Z. (iii) The employer shall not implement a schedule of employee rotation as a means of compliance with permissible exposure limits or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

(2) Engineering controls, work practices, and PPE for substances not regulated in Subparts G and Z. An appropriate combination of engineering controls, work practices, and personal protective equipment shall be used to reduce and maintain employee exposure to or below published exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Z. The employer may use the published literature and MSDS as a guide in making the employer's determination as to what level of protection the employer believes is appropriate for hazardous substances and health hazards for which there is no permissible exposure limit or published exposure limit.

(3) Personal protective equipment selection. (I) Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis. (ii) Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site. (iii) Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply shall be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape. (iv) Totally-encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape. (v) The level of protection provided by PPE selection shall be increased when

additional information or site conditions show that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards. (See Appendix B for guidance on selecting PPE ensembles.)

NOTE TO (g)(3): The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.

(vi) Personal protective equipment shall be selected and used to meet the requirements of 29 CFR Part 1910, Subpart I, and additional requirements specified in this section.

(4) Totally-encapsulating chemical protective suits. (i) Totally-encapsulating suits shall protect employees from the particular hazards which are identified during site characterization and analysis. (ii) Totally-encapsulating suits shall be capable of maintaining positive air pressure. (See Appendix A for a test method which may be used to evaluate this requirement.) (iii) Totally-encapsulating suits shall be capable of preventing inward test gas leakage of more than 0.5 percent. (See Appendix A for a test method which may be used to evaluate this requirement.)

(5) Personal protective equipment (PPE) program. A personal protective equipment program, which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraph (p)(1) of this section and which is also a part of the site-specific safety and health plan shall be established. The PPE program shall address the elements listed below. When elements, such as donning and doffing procedures, are provided by the manufacturer of a piece of equipment and are attached to the plan, they need not be rewritten into the plan as long as they adequately address the procedure or element. (i) PPE selection based upon site hazards, (ii) PPE use and limitations of the equipment, (iii) Work mission duration, (iv) PPE maintenance and storage, (v) PPE decontamination and disposal, (vi) PPE training and proper fitting, (vii) PPE donning and doffing procedures, (viii) PPE inspection procedures prior to, during, and after use, (ix) Evaluation of the effectiveness of the PPE program, and (x) Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

#### **(h) Monitoring.**

(1) General. (i) Monitoring shall be performed in accordance with this paragraph where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances. (ii) Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection needed on site.

(2) Initial entry. Upon initial entry, representative air monitoring shall be conducted to identify any IDLH condition, exposure over permissible exposure limits or published exposure levels, exposure over a radioactive material's dose limits or other dangerous condition such as the presence of flammable atmospheres, oxygen-deficient environments.

(3) Periodic monitoring. Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows: (i) When work begins on a different portion of the site. (ii) When contaminants other than those previously identified are being handled. (iii) When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.) (iv) When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)

(4) Monitoring of high-risk employees. After the actual clean-up phase of any hazardous waste operation commences; for example, when soil, surface water or containers are moved or disturbed; the employer shall monitor those employees likely to have the highest exposures to those hazardous substances and health hazards likely to be present above permissible exposure limits or published exposure levels by using personal sampling frequently enough to characterize employee exposures. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated in the first sentence of this paragraph. If the employees likely to have the highest exposure are over permissible exposure limits or published exposure limits, then monitoring shall continue to determine all employees likely to be above those limits. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated above.

NOTE TO (h): It is not required to monitor employees engaged in site characterization operations covered by paragraph (C) of this section.

#### **(i) Informational programs.**

Employers shall develop and implement a program which is part of the employer's safety and health program required in paragraph (b) of this section to inform employees, contractors, and subcontractors (or their representative) actually engaged in hazardous waste operations of the nature, level and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors and subcontractors working outside of the operations part of a site are not covered by this standard.

#### **(j) Handling drums and containers**

(1) General. (i) Hazardous substances and contaminated, liquids and other residues shall be handled, transported, labeled, and disposed of in accordance with this paragraph. (ii) Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain. (iii) When practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling. (iv) Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. (v) Site operations shall be organized to minimize the amount of drum or container movement. (vi) Prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers. (vii) U.S. Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur. (viii) Where major spills may occur, a spill containment program, which is part of the employer's safety and health program required in paragraph (b) of this section, shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. (ix) Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred. (x) A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers. (xi) Soil or covering material shall be removed with caution to prevent drum or container rupture. (xii) Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, shall be on hand and ready for use to control incipient fires.

(2) Opening drums and containers. The following procedures shall be followed in areas where drums or containers are being opened: (i) Where an airline respirator system is used, connections to the source of air supply shall be protected from contamination and the entire system shall be protected from physical damage. (ii) Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened. (iii) If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation shall be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion. (iv) Controls for drum or container opening equipment, monitoring equipment, and

fire suppression equipment shall be located behind the explosion-resistant barrier. (v) When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition. (vi) Drums and containers shall be opened in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding shall be placed between the employee and the drums or containers to reduce the risk of employee injury. (vii) Employees shall not stand upon or work from drums or containers.

(3) Material handling equipment. Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

(4) Radioactive wastes. Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

(5) Shock sensitive wastes. As a minimum, the following special precautions shall be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled: (I) All non-essential employees shall be evacuated from the area of transfer. (ii) Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers. (iii) An employee alarm system capable of being perceived above surrounding light and noise conditions shall be used to signal the commencement and completion of explosive waste handling activities. (iv) Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) shall be maintained between the employee-in-charge of the immediate handling area and both the site safety and health supervisor and the command post until such time as the handling operation is completed. Communication equipment or methods that could cause shock sensitive materials to explode shall not be used. (v) Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum. (vi) Drums and containers containing packaged laboratory wastes shall be considered to contain shock-sensitive or explosive materials until they have been characterized.

Caution: Shipping of shock sensitive wastes may be prohibited under U.S. Department of Transportation regulations. Employers and their shippers should refer to 49 CFR 173.21 and 173.50.

(6) Laboratory waste packs. In addition to the requirements of paragraph (j)(5) of this section, the following precautions shall be taken, as a minimum, in handling laboratory waste packs (lab packs): (I) Lab packs shall be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes. (ii) If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

(7) Sampling of drum and container contents. Sampling of containers and drums shall be done in accordance with a sampling procedure which is part of the site safety and health plan developed for and available to employees and others at the specific worksite.

(8) Shipping and transport. (I) Drums and containers shall be identified and classified prior to packaging for shipment. (ii) Drum or container staging areas shall be kept to the minimum number necessary to safely identify and classify materials and prepare them for transport. (iii) Staging areas shall be provided with adequate access and egress routes. (iv) Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.

(9) Tank and vault procedures. (I) Tanks and vaults containing hazardous substances shall be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault. (ii) Appropriate tank or vault entry procedures as described in the employer's safety and health plan shall be followed whenever employees must enter a tank or vault.

## **(k) Decontamination**

(1) General. Procedures for all phases of decontamination shall be developed and implemented in accordance with this paragraph.

(2) Decontamination procedures. (i) A decontamination procedure shall be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists. (ii) Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances. (iii) All employees leaving a contaminated area shall be appropriately decontaminated; all contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated. (iv) Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

(3) Location. Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

(4) Equipment and solvents. All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

(5) Personal protective clothing and equipment. (i) Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness. (ii) Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove that clothing and proceed to shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone.

(6) Unauthorized employees shall not remove protective clothing or equipment from change rooms.

(7) Commercial laundries or cleaning establishments. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances.

(8) Showers and change rooms. Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 29 CFR 1910.141. If temperature conditions prevent the effective use of water, then other effective means for cleansing shall be provided and used.

## **(l) Emergency response by employees at uncontrolled hazardous waste sites**

(1) Emergency response plan. (i) An emergency response plan shall be developed and implemented by all employers within the scope of paragraphs (a)(1)(i) through (ii) of this section. section to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, OSHA personnel and other governmental agencies with relevant responsibilities. (ii) Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.

(2) Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following: (i) Pre-emergency planning. (ii) Personnel roles, lines of authority, training, and communication. (iii) Emergency recognition and prevention. (iv) Safe distances and places of refuge. (v) Site security and control. (vi) Evacuation routes and procedures. (vii) Decontamination procedures which are not covered by the site safety and health plan. (viii) Emergency medical treatment and first aid. (ix) Emergency alerting and response procedures. (x) Critique of response and follow-up. (xi) PPE and emergency equipment.

(3) Procedures for handling emergency incidents. (i) In addition to the elements for the emergency response plan required in paragraph (1)(2) of this section, the following elements shall be included for emergency response plans: (A) Site topography, layout, and prevailing weather conditions. (B) Procedures for reporting incidents to local, state, and federal governmental agencies. (ii) The emergency response plan shall be a separate section of the Site Safety and Health Plan. (iii) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies. (iv) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations. (v) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information. (vi) An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation, to stop work activities if necessary, to lower background noise in order to speed communication, and to begin emergency procedures. (vii) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

**(m) Illumination.**

Areas accessible to employees shall be lighted to not less than the minimum illumination intensities listed in the following Table H-120.1 while any work is in progress.

**(n) Sanitation at temporary workplaces**

(1) Potable water. (i) An adequate supply of potable water shall be provided on the site. (ii) Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from containers. (iii) Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose. (iv) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(2) Nonpotable water. (i) Outlets for nonpotable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes. (ii) There shall be no cross-connection, open or potential, between a system furnishing potable water and a system furnishing nonpotable water.

(3) Toilets facilities. (i) Toilets shall be provided for employees according to Table H-120.2. (ii) Under temporary field conditions, provisions shall be made to assure not less than one toilet facility is available. (iii) Hazardous waste sites, not provided with a sanitary sewer, shall be provided with the following toilet facilities unless prohibited by local codes: (A) Chemical toilets; (B) Recirculating toilets; (C) Combustion toilets; or (D) Flush toilets. (iv) The requirements of this paragraph for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities. (v) Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.

(4) Food handling. All food service facilities and operations for employees shall meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

(5) Temporary sleeping quarters. When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.

(6) Washing facilities. The employer shall provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities shall be in near proximity to the worksite; in areas where exposures are below permissible exposure limits and which are under the controls of the employer; and shall be so equipped as to enable employees to remove hazardous substances from themselves.

(7) Showers and change rooms. When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer shall provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations. (i) Showers shall be provided and shall meet the requirements of 29 CFR 1910.141(d)(3). (ii) Change rooms shall be provided and shall meet the requirements of 29 CFR 1910.141(e). Change rooms shall consist of two separate change areas separated by the shower area required in paragraph (n)(7)(I) of this section. One change area, with an exit leading off the worksite, shall provide employees with an area where they can put on, remove and store work clothing and personal protective equipment. (iii) Showers and change rooms shall be located in areas where exposures are below the permissible exposure limits and published exposure levels. If this cannot be accomplished, then a ventilation system shall be provided that will supply air that is below the permissible exposure limits and published exposure levels. (iv) Employers shall assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

**(o) New technology programs.**

(1) The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(2) New technologies, equipment or control measures available to the industry, such as the use of foams, absorbents, neutralizers, or other means to suppress the level of air contaminants while excavating the site or for spill control, shall be evaluated by employers or their representatives. Such an evaluation shall be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection. Information and data from manufacturers or suppliers may be used as part of the employer's evaluation effort. Such evaluations shall be made available to OSHA upon request.

**(p) Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA).**

Employers conducting operations at treatment, storage and disposal (TSD) facilities specified in paragraph (a)(1)(iv) of this section shall provide and implement the programs specified in this paragraph. See the "Notes and Exceptions" to paragraph (a)(2)(iii) of this section for employers not covered.

(1) Safety and health program. The employer shall develop and implement a written safety and health program for employees involved in hazardous waste operations that shall be available for inspection by employees, their representatives and OSHA personnel. The program shall be designed to identify, evaluate and control safety and health hazards in their facilities for the purpose of employee protection, to provide for emergency response meeting the requirements of paragraph (p)(8) of this section and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and uses of new technologies.

(2) Hazard communication program. The employer shall implement a hazard communication program meeting the requirements of 29 CFR 1910.1200 as part of the employer's safety and program.

NOTE TO 1910.120 - The exemption for hazardous waste provided in 1910.1200 is applicable to this section.

(3) Medical surveillance program. The employer shall develop and implement a medical surveillance program meeting the requirements of paragraph (f) of this section.

(4) Decontamination program. The employer shall develop and implement a decontamination procedure meeting the requirements of paragraph (k) of this section.

(5) New technology program. The employer shall develop and implement procedures meeting the requirements of paragraph (o) of this section for introducing new and innovative equipment into the workplace.

(6) Material handling program. Where employees will be handling drums or containers, the employer shall develop and implement procedures meeting the requirements of paragraphs (j)(1)(ii) through (viii) and (xi) of this section, as well as (j)(3) and (j)(8) of this section prior to starting such work.

(7) Training program - (I) New employees. The employer shall develop and implement a training program which is part of the employer's safety and health program, for employees exposed to health hazards or hazardous substances at TSD operations to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for eight hours annually. Employees who have received the initial training required by this paragraph shall be given a written certificate attesting that they have successfully completed the necessary training. (ii) Current employees. Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this paragraph, shall be considered as meeting the initial training requirements of this paragraph as to that employee. Equivalent training includes the training that existing employees might have already received from actual site work experience. Current employees shall receive eight hours of refresher training annually. (iii) Trainers. Trainers who teach initial training shall have satisfactorily completed a training course for teaching the subjects they are expected to teach or they shall have the academic credentials and instruction experience necessary to demonstrate a good command of three subject matter of the courses and competent instructional skills.

(8) Emergency response program - (I) Emergency response plan. An emergency response plan shall be developed and implemented by all employers. Such plans need not duplicate any of the subjects fully addressed in the employer's contingency planning required by permits, such as those issued by the U.S. Environmental Protection Agency, provided that the contingency plan is made part of the emergency response plan. The emergency response plan shall be a written portion of the employers safety and health program required in paragraph (p)(1) of this section. Employers who will evacuate their employees from the worksite location when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of paragraph (p)(8) if they provide an emergency action plan complying with section 1910.38(a) of this part. (ii) Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following areas to the extent that they are not addressed in any specific program required in this paragraph: (A) Pre-emergency planning and coordination with outside parties. (B) Personnel roles, lines of authority, training, and communication. (C) Emergency recognition and prevention. (D) Safe distances and places of refuge. (E) Site security and control. (F) Evacuation routes and procedures. (G) Decontamination procedures. (H) Emergency medical treatment and first aid. (I) Emergency alerting and response procedures. (J) Critique of response and follow-up. (K) PPE and emergency equipment. (iii) Training. (A) Training for emergency response employees shall be completed before they are called upon to perform in real emergencies. Such training shall include the elements of the emergency response plan, standard operating procedures the employer has established for the job, the personal protective equipment to be worn and procedures for handling emergency incidents.

Exception #1: an employer need not train all employees to the degree specified if the employer divides the work force in a manner such that a sufficient number of employees who have responsibility to control emergencies have the training specified, and all other employees, who may first respond to an emergency incident, have sufficient awareness training to recognize that an emergency response situation exists and that they are instructed in that case to summon the fully trained employees and not attempt control activities for which they are not trained.

Exception #2: An employer need not train all employees to the degree specified if arrangements have been made in advance for an outside fully-trained emergency response team to respond in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside fully-trained emergency response team for assistance.

(B) Employee members of TSD facility emergency response organizations shall be trained to a level of competence in the recognition of health and safety hazards to protect themselves and other employees. This would include training in the methods used to minimize the risk from safety and health hazards; in the safe use of control equipment; in the selection and use of appropriate personal protective equipment; in the safe operating procedures to be used at the incident scene; in the techniques of coordination with other employees to minimize risks; in the appropriate response to over exposure from health hazards or injury to themselves and other employees; and in the recognition of subsequent symptoms which may result from over exposures. (C) The employer shall certify that each covered employee has attended and successfully completed the training required in paragraph (p)(8)(iii) of this section, or shall certify the employee's competency for certification of training shall be recorded and maintained by the employer. (iv) Procedures for handling emergency incidents. (A) In addition to the elements for the emergency response plan required in paragraph (p)(8)(ii) of this section, the following elements shall be included for emergency response plans to the extent that they do not repeat any information already contained in the emergency response plan: {1}Site topography, layout, and prevailing weather conditions. {2}Procedures for reporting incidents to local, state, and federal governmental agencies. (B) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies. (C) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations. (D) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information. (E) An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation, to stop work activities if necessary, to lower back-ground noise in order to speed communication; and to begin emergency procedures. (F) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

#### **(q) Emergency response program to hazardous substance releases.**

This paragraph covers employers whose employees are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations specified in paragraphs (a)(1)(I) through (a)(1)(iv) of this section. Those emergency response organizations who have developed and implemented programs equivalent to this paragraph for handling releases of hazardous substances pursuant to section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11003) shall be deemed to have met the requirements of this paragraph.

(1) Emergency response plan. An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, OSHA personnel. Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.

(2) Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following areas to the extent that they are not addressed in any specific program required in this paragraph: (I) Pre-emergency planning and coordination with outside parties. (ii) Personnel roles, lines of authority, training, and communication. (iii) Emergency recognition and prevention. (iv) Safe distances and places of refuge. (v) Site security and control. (vi) Evacuation routes and procedures. (vii) Decontamination. (viii) Emergency medical treatment and first aid. (ix) Emergency alerting and response procedures. (x) Critique of response and follow-up. (xi)

PPE and emergency equipment. (xii) Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer and employee's use.

(3) Procedures for handling emergency response. (I) The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

NOTE TO (q)(3)(I). - The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established. (ii) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies. (iii) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29 CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage for any incident. (iv) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees. (v) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more. (vi) Back-up personnel shall be standing by with equipment ready to provide assistance or rescue. Qualified basic life support personnel, as a minimum, shall also be standing by with medical equipment and transportation capability. (vii) The individual in charge of the ICS shall designate a safety officer, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand. (viii) When activities are judged by the safety officer to be an IDLH and/or to involve an imminent danger condition, the safety officer shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene. (ix) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures. (x) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

(4) Skilled support personnel. Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the employer's regular employees. However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards

are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

(5) Specialist employees. Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

(6) Training. Training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders, those hired after the effective date of this standard, shall be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident. Employees who participate, or are expected to participate, in emergency response, shall be given training in accordance with the following paragraphs: (i) First responder awareness level. First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the authorities of the release. First responders at the awareness level shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas: (A) An understanding of what hazardous substances are, and the risks associated with them in an incident. (B) An understanding of the potential outcomes associated with an emergency created when hazardous substances are present. (C) The ability to recognize the presence of hazardous substances in an emergency. (D) The ability to identify the hazardous substances, if possible. (E) An understanding of the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the U.S. Department of Transportation's Emergency Response Guidebook. (F) The ability to realize the need for additional resources, and to make appropriate notifications to the communication center. (ii) First responder operations level. First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify: (A) Knowledge of the basic hazard and risk assessment techniques. (B) Know how to select and use proper personal protective equipment provided to the first responder operational level. (C) An understanding of basic hazardous materials terms. (D) Know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit. (E) Know how to implement basic decontamination procedures. (F) An understanding of the relevant standard operating procedures and termination procedures. (iii) Hazardous materials technician. Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch or otherwise stop the release of a hazardous substance. Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify: (A) Know how to implement the employer's emergency response plan. (B) Know the classification, identification and verification of known and unknown materials by using field survey instruments equipment. (C) Be able to function within an assigned role in the Incident Command System. (D) Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician. (E) Understand hazard and risk assessment techniques. (F) Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit. (G) Understand and implement decontamination procedures. (H) Understand termination procedures. (I) Understand basic chemical and toxicological terminology and behavior. (iv) Hazardous materials specialist. Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific knowledge of the various

substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local and other government authorities in regards to site activities. Hazardous materials specialists shall have competency in the following areas and the employer shall so certify: (A) Know how to implement the local emergency response plan. (B) Understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment. (C) Know the state emergency response plan. (D) Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist. (E) Understand in-depth hazard and risk techniques. (F) Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available. (G) Be able to determine and implement decontamination procedures. (H) Have the ability to develop a site safety and control plan. (I) Understand chemical, radiological and toxicological terminology and behavior. (v) On scene incident commander. Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, shall receive at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify: (A) Know and be able to implement the employer's incident command system. (B) Know how to implement the employer's emergency response plan. (C) Know and understand the hazards and risks associated with employees working in chemical protective clothing. (D) Know how to implement the local emergency response plan. (E) Know of the state emergency response plan and of the Federal Regional Response Team. (F) Know and understand the importance of decontamination procedures.

(7) Trainers. Trainers who teach any of the above training subjects shall have satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. National Fire Academy, or they shall have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.

(8) Refresher training. (i) Those employees who are trained in accordance with paragraph (q)(6) of this section shall receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate competency in those areas at least yearly. (ii) A statement shall be made of the training or competency, and if a statement of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.

(9) Medical surveillance and consultation. (i) Members of an organized and designated HAZMAT team and hazardous materials specialist shall receive a baseline physical examination and be provided with medical surveillance as required in paragraph (f) of this section. (ii) Any emergency response employees who exhibit signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident either immediately or subsequently, shall be provided with medical consultation as required in paragraph (f)(3)(ii) of this section.

(10) Chemical protective clothing. Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists, shall meet the requirements of paragraphs (g)(3) through (5) of this section.

(11) Post-emergency response operations. Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the clean-up shall comply with one of the following: (i) Meet all the requirements of paragraphs (b) through (o) of this section; or (ii) Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38(a); 1910.134; 1910.1200, and other appropriate safety and health training made necessary by the tasks that they are expected to be performed such as personal protective equipment and decontamination procedures. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use.